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CALIFORNIA MANZANITA FOR SMOKING PIPES

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Since supplies of genuine brierwood have been largely cut off from the American smoking-pipe industry by war conditions, manufacturers have been seeking sources of suitable domestic woods. Recently the production of manzanita pipe blocks has begun on a commercial scale, and a lively interest in the new industry has developed among both pipe manufacturers and California landowners. It is hoped that this article will serve the dual purpose of acquainting pipe manufacturers with manzanita and of informing interested Californians about the history and recent developments in the pipe-wood trade.

Production of Brierwood Pipe Blocks1/

The wood of the root burl of tree heath (Erica arborea), commonly called brierwood, has been favored for pipe bowls since about 1860. This dwarf tree is distributed to some extent throughout all the Mediterranean countries, and in normal times most of these countries have exported varying quantities of the wood to the United States in the form of blocks from which pipes are manufactured.

The pipe-block industry started in France and spread to Italy, which maintained dominance in the trade until the first decade of the present century. At that time the depletion of the brierwood stands forced manufacturers of blocks to seek new supplies in Algeria.

1/ Burls are cut into small blocks, each one of a size suitable for the manufacture of a single pipe bowl.

Regeneration has brought the stands of France and Italy back to importance in the past decade. France led in exports of blocks to this country in 1929, 1930, and 1931, and since then Italy has been our chief source of supply until the present war period.

Algeria produced about two-thirds of the world supply of brierwood during the period 1919 to 1928, with a maximum production of about 22,000 tons of green burls in 1924. Her average production was 13,200 tons from 1910 to 1937. Against this figure the estimated capacity of the country for growing burls is only 11,000 tons, based on a rotation of 45 years (average age of utilization). Obviously, exploitation has gone beyond the sustained-yield basis for the whole area in spite of the fact that most of the producing land is publicly owned, with cutting controlled under a leasing system. It is probably safe to assume that overcutting has been as extensive in France and Italy as in Algeria. The industry has evidently exploited the best of the virgin stands of Mediterranean brierwood and has fallen back on second growth. With lack of cutting control and with increasing world demand it is likely that the world supply of tree heath burls will eventually be seriously diminished.

Alternative Woods for Pipe Bowls

The American smoking-pipe industry, having an estimated current demand for 40 million blocks annually, has turned its interest to domestic woods since war conditions have cut off supplies of brierwood. With the Mediterranean resource badly depleted, this temporary stress in the pipe wood market may offer an opportunity for the introduction of permanent alternatives rather than temporary substitutes for brierwood.

Alternative woods for pipe bowls must have the same qualities that are found in the burl wood of tree heath: (1) resistance to charring, (2) absence of disagreeable odor in charring, (3) resistance to checking under heat, (4) strength, (5) attractive figure (flame grain, if possible), (6) reception to coloring with stain, (7) ability to take polish. The tangled fiber structure of burl wood supplies the features of attractive figure and homogeneous strength properties. In addition to technical qualities a merchantable wood must occur in burls of good quality in quantities that are accessible enough to repay establishment of block-cutting mills.

California possesses one widespread member of its extensive brush fields that has satisfied the above requirements to the extent that three factories have been established for pipe-block cutting. This is manzanita (Arctostaphylos spp.). The burl-forming species of this genus produce wood that is not quite so dense as brierwood but is entirely satisfactory as regards smoking quality and figure.

Comparison of Manzanita and Tree Heath

There are a number of similarities between the burl-forming manzanita and tree heath. Both are major constituents of closely related brush types. The maqui of the Mediterranean region, in which tree heath occurs, is a

dense shrub type, similar in aspect to the Pacific Coast chaparral, where manzanitas make up a large share of the vegetation. Species of scrub oak are common associates of each. These shrub types grow under like climatic conditions, in a temperate region with summer drought and winter rainfall. They are found primarily in coastal and foothill areas. Often they will invade former forest sites, after fire or cutting has destroyed the tree cover.

Manzanita and tree heath are related to each other botanically, belonging to the Ericaceae, or heath family. Both are hardy shrubs, capable of growing on poor soils and of withstanding drought. However, although the leaf forms are both typical of drought-resisting plants, they are quite different in appearance. Tree heath has narrow, linear leaves arranged in whorls of three or four, and manzanita has thick, leathery, alternate leaves.

Another common characteristic, and a very important one, is their ability to form burls. The burl is an aggregation of short branchlets fused into a complex, patterned mass of wood. At its surface the branchlets are terminated by dormant buds, which are capable of sprouting when the main trunk is destroyed or the plant undergoes fire or other injury. However, this does not mean that the burl formation itself is a reaction of the plant to fire or cutting, although these may affect its size or shape. The best burls for the purpose of pipe manufacture are those which have grown to merchantable size in areas where no fires have occurred. The incipient burl appears in very young plants and seems to be a normal development characteristic of certain species, including tree heath and the sprouting manzanitas. In studies made on tree heath in Algeria no pathological source of the formation was discovered. The initial cause of the swelling, which appears at the base of the stem in the young plant, is still unknown. A comparison of photographs of seedlings and young plants of sprouting manzanitas and tree heath, showing the growth of the burl, discloses a parallel development in the two groups.

In appearance, the wood of manzanita burl is much like brier burl; it also has the flame pattern, one of the desirable qualities of brierwood.

In Algeria the optimum age for the utilization of brier burls is 45 years for the country as a whole (40 years on the coast and in the foothills and 50 years in the higher mountains). Tree heath of this age produces burls of 4½ to 9 pounds measuring approximately 6 to 8 inches in diameter. Manzanita burls probably develop more rapidly. The following figures were obtained from measurement of one well-formed manzanita burl 12 inches in diameter taken from the coastal area of California:

Annual rings from center	Diameter (inches)
5	0.55
10	1.15
15	3.30
20	6.80
25	9.25

Range of Manzanita in California

The manzanitas can be divided into two broad classes: (1) those that are killed outright by fire, and (2) those that sprout from a woody root-crown after fire has gone through the stand. It is the latter group in which we are interested, as they are the burl-forming species. The sprouting manzanitas, common constituents of the chaparral in California, are widely distributed throughout the Coast Ranges, the mountains of southern California, and the Sierra Nevada foothills. The most important of these is the complex of species including woolly manzanita (Arctostaphylos tomentosa), Eastwood manzanita (A. glandulosa), and closely allied forms, occurring in the north and south Coast Ranges and in southern California. Shagbark manzanita (A. rudis), although limited to western Santa Barbara County and the southwestern corner of San Luis Obispo County, is an important burl-forming species. In the Sierra Nevada foothills Indian manzanita (A. mewukka) forms burls that might also be used commercially. Greenleaf manzanita (A. patula), a sprouting species of the Sierra Nevada and north Coast Ranges, is not included in the accompanying map (pl. 1) showing the distribution of manzanitas in California, because in the areas so far investigated the burls of this species are apparently of minor importance.2/

Distributions of the species shown on the map are taken largely from data collected by the vegetation type survey of California.3/ However, with the exception of portions of Napa, Lake, and Mendocino Counties, the survey did not cover the north Coast Ranges, and data for this section are taken from locations where herbarium specimens of the manzanitas of the Arctostaphylos glandulosa—A. tomentosa group have been collected, so that the distribution there is more widespread than indicated on the map. Another section which has not yet been mapped by the survey extends from Madera County to Tulare County. Arctostaphylos mewukka is distributed through the foothills of the Sierra Nevada in these counties, but not in abundance. It is not shown on the map because of the lack of accurate data.

The survey data show areas in which burl-forming manzanitas make up 20 percent or more of the shrubby vegetation. Because of the small scale of the distribution map it was necessary to run these areas together into larger units, so that the manzanita regions shown on the map are actually made up of scattered but closely adjacent areas.

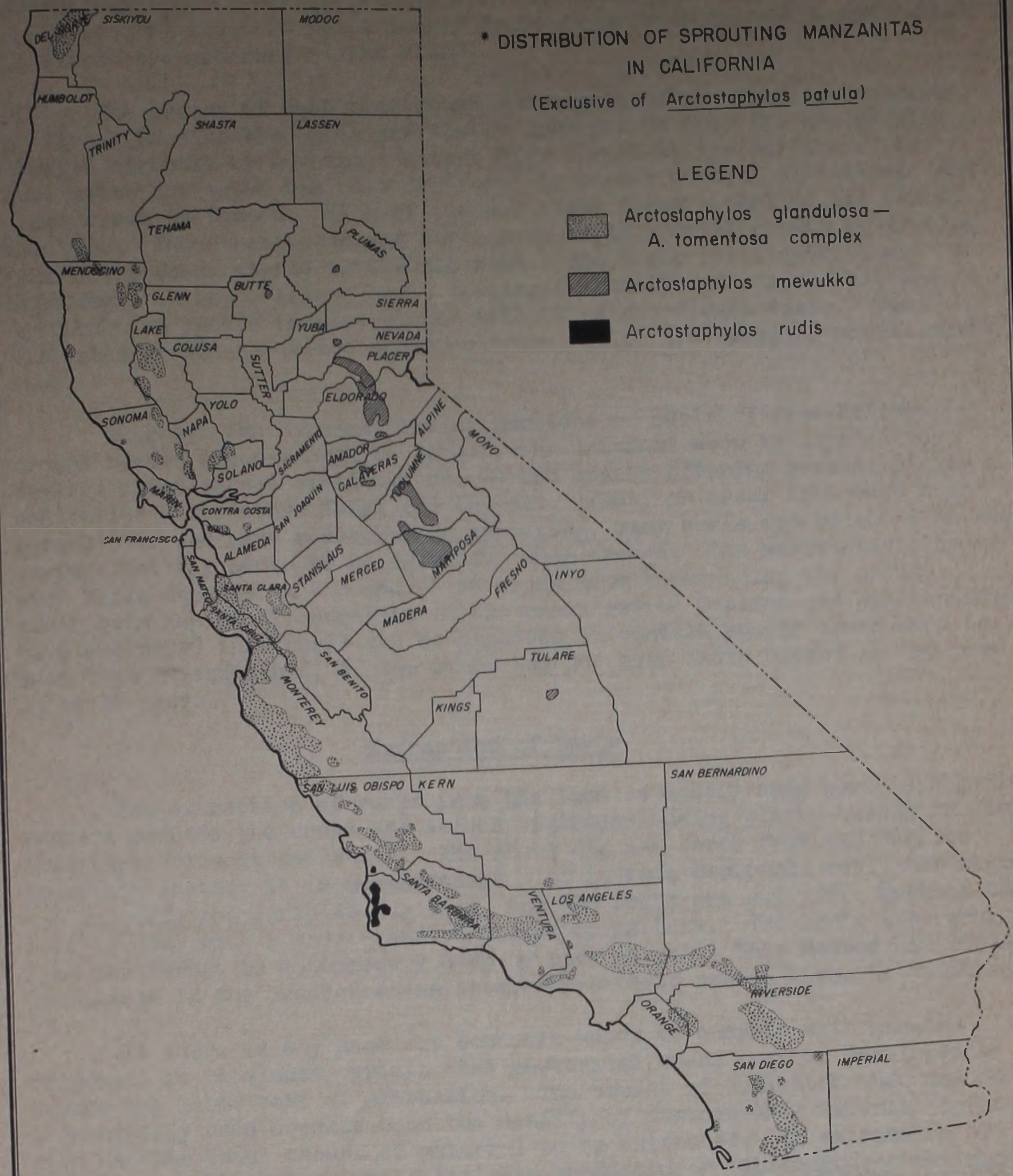
2/ Other burl-forming species of California that might bear investigation as pipe material are the silktassels (Garrya spp.), California snowbell (Styrax californica), coast rhododendron (Rhododendron californicum), and several of the ceanothus species, Palmer ceanothus (C. palmeri), spiny ceanothus (C. spinosus), Lemmon ceanothus (C. lemmonii), and woollyleaf ceanothus (C. tomentosus). Although burl-forming, these shrubs may not prove to be commercially valuable. Chamise (Adenostoma fasciculatum), widely distributed throughout the chaparral areas of the State, appears to be unimportant because of the small size of the burls. Another shrub, redshanks (Adenostoma sparsifolium), forms large burls and might repay further study, although one operator has reported that the wood is too hard to work profitably. For ranges of these species, consult McMinn, An Illustrated Manual of California Shrubs (4).

3/ See Wieslander, A Vegetation Type Map of California (8).

Plate I.

* DISTRIBUTION OF SPROUTING MANZANITAS IN CALIFORNIA

(Exclusive of Arctostaphylos patula)



* Data incomplete for north Coast Ranges; see text.

Effect of brush fires

It is a commonly mistaken notion that fires are the cause of burl formation in manzanita. Far from being beneficial, brush fires are the cause of internal defects and distorted shape, which detract from the merchantability of burls. It has been estimated that in Algeria brier burls require about 20 years longer to reach merchantable size and quality if fires have occurred in the stand.

The crowns of both tree heath and manzanita are readily destroyed by fire. Because the burls are mostly underground they are not usually damaged directly by burning. Latent buds sprout at the surface of the burl after the crown has been destroyed by either burning or cutting, and a new crown is formed. Each of the new stems forms a burl of its own at its base. These new stems and burls make rapid initial growth by drawing upon plant foods stored in the old root. The shoot burls develop as appendages on the original burl, forming extremely odd shapes that are difficult to reduce to pipe blocks without extraordinary waste. The distorted growth sometimes encloses rocks, which are damaging to the mill saws.

Although the external living portions of burls of fire-killed crowns remain green enough to sprout, the internal wood is exposed to drying, which causes shrinkage checks and cracks offering avenues of invasion for destructive fungi and insects. Thus, on areas that have been burned over and have recovered by sprouting, many burls appear sound on the surface but may prove to be defective when opened. The merchantability of such burls depends on the amount of sound wood surrounding the defect. After examination of manzanita in the coast region Garland and Wieslander4/ have estimated that burls may be expected to contain enough sound wood to make them merchantable, if the stand has not been badly burned in the past 25 or 30 years.

Extraction of Burls

The extraction of burls from the land is mostly hand work in Algeria. Hunters precede the crews and select vigorous-looking plants having no more than three closely set stems. The crews dig the earth from the burl to ascertain whether it is merchantable. If it is a desirable burl, the stems are cut off, the earth is dug away, and the roots are cut off. Most of the work is done with a short-handled pickax or mattock. The burls are removed from the forest to a temporary dump by pack animal. This method has proved profitable in the Mediterranean area, where cheap native labor is obtainable.

If there is any hope for domestic woods to compete with genuine brierwood it is almost certain that mechanical means must be developed to reduce the labor cost of extraction. The amount of equipment that may be economically used depends upon the density of merchantable material in an area and the total amount of material to be extracted. In extraction of mountain laurel (Kalmia latifolia) and rhododendron (Rhododendron maximum) in the southern Appalachians hand-operated stump pullers of the block and tackle type have been used recently.

4/ A. E. Wieslander, In charge, Forest Survey Division, California Forest and Range Experiment Station.

In a California location in sandy soil where burl-forming manzanita comprised about 20 percent of the stand, a gasoline-powered cable-and-drum stump puller has been used to advantage with a three-man crew, one man to operate the machine; another to cut the crown, partly expose the burl by digging, and hook the cable; and a third to cut the root and branch stubs and pile the burls (pl. 2). Another California operator has used to advantage a tractor in combination with bulldozer in dense stands of burl-forming plants on level ground.

Although extraction costs might be drastically reduced by the development of more efficient equipment, this development may be limited by the capacity of the block mills. An ordinary mill is not able to use more than 10 tons of burls per day. If the capacity of the woods crew were to exceed this consistently, the operation would have to be an intermittent one and additional cost would be incurred in large-scale storage of burls.

Burls of both brierwood and manzanita check and split in the whole piece because of shrinkage at the slightest drying. For this reason care must be taken to retard drying from the time the crowns are cut off until the burls are cut into blocks. In the woods the piles of burls are covered with green branches cut from the plants to protect them from the sun. In storage, the piles must be wet down periodically with water (pl. 3). In Algeria piles of burls are covered with ferns, grass, or other green leaves. They may not be left in the piles for more than 9 months without danger of decay and stain.

Manufacture of Blocks

The amount of usable pipe-block material that can be cut from a ton of burls depends on the amount of defect in the burls and on the skill of the workmen. The highest average amount recovered by the best workers in Algeria is about 35 percent of the green weight; the average for all Algerian brierwood operations is about 20 to 25 percent. Probably recovery in manzanita does not average so high as this except for burls that have not been damaged by fire.

Twenty-three different types and sizes of pipe blocks are recognized in the industry. In typical European mills, there are rows of identical circular table saws, each with an operator. An operator is given a burl or a piece of burl and is charged with cutting out the best possible combination of block types, at the same time attempting to cut the pattern of the flame grain so that it is parallel with the axis of the bowl. Each operator performs the whole operation of turning out completely sawed blocks.

Some mills in this country have been designed on the "line production" principle. The material passes from one saw to the next, each operator making a different cut. The first saw cuts the burl into slabs; the next cuts the slabs into strips; the next cuts the strips into blocks; and the last one cuts off part of the block to give it the shape of the pipe

Plate 2.

A. Opening in brush field in Monterey County where burls have been extracted. Worker is chopping off excess branches and roots. Note burls in foreground ready to be hauled to pipe-block mill.

B. Burl formation at the base of Eastwood manzanita shrub in Santa Cruz County. This is larger than normal but fairly typical of quality found in some areas.

Plate 3.

A. Truck load of burls from Monterey County.

B. Burls from Monterey County stored in shed, where they are wet down periodically to keep them from drying out. Note moisture on floor.

model for which the grain is most suited. In this cutting method there is much less possibility of obtaining blocks that will show a well-patterned flame grain on the finished pipe.

Pipe blocks are sold according to quality, as well as size and shape. Brier pipes retail at 25 cents and up. There is a large market for pipes selling at less than a dollar. Such pipes usually have small defects that may be filled in finishing and hidden by applying a dark stain. Expensive pipes are made from relatively rare blocks that are without flaws and are cut from the burl so that the grain produces a symmetrical pattern. The normal pipe-block market requires a balance in the supply of low- and high-grade material. Burls need not be without defect to be merchantable; however, they must be sound enough to yield a reasonable proportion of volume in usable blocks. Under present market conditions it is possible that large quantities of "clean" burl material would not be in so much demand as material that yields different grades of blocks, since the market for high-grade blocks is limited.

Before the present war period the average price paid by American pipe makers for brier was approximately 2 cents per block. Some shipments of genuine brier were still coming into the country in 1941, but the cost to the manufacturer had been increased about fourfold because of shipping and insurance rates. Pipe makers were then paying an average of 6 cents each for domestic blocks that were suitable substitutes for brier.

Extent of the Pipe-block Industry in the United States

In the summer of 1941 seven pipe-block mills in the southern Appalachians, using burls of mountain laurel (Kalmia latifolia) and rhododendron (Rhododendron maximum), were producing an amount estimated at one-fourth of the demand of the American pipe industry. The wood of these plants is evidently entirely suitable for pipes; however, the supply of burls in the area may not be large enough to satisfy the demands of the present mills. Only part of the plants produce burls, and these only at an advanced age. The burl-forming plants occur in thickets or clumps scattered in areas not exceeding two or three hundred acres. Scouting for the plants appears to be an important element in the Appalachian industry. Burl prices at the mill in 1941 were $10 to $12 per ton, of which about $1 to $1.25 represents stumpage.

In midsummer of 1941 two relatively large block mills were established in California to cut manzanita grown in Santa Cruz and Monterey Counties. Both these mills are associated with large pipe companies. More recently another plant has been established in this area and there were plans for a fourth. There has been a rather active competition among mills for the contracted supply of burls, but the price of merchantable burls delivered has not exceeded about $12 per ton. At least one mill operator has asked for 10-year contracts for exclusive purchase rights on some manzanita land.

This new California industry has centered around Watsonville. There are probably other fairly extensive areas of merchantable burl in the range of the sprouting manzanitas, but at this time little is known of their extent and accessibility.

One mill began operating in the Los Angeles area in 1941, using the burl of redshanks (Adenostoma sparsifolium). It is reported that this operation was discontinued because of manufacturing difficulties. Burls are readily available, of good quality, and suitable for pipes, but the operator has found the wood to be too hard to work into pipe blocks profitably.

Future Possibilities for Manzanita

With the burl resource of the Appalachian region apparently being exploited to its limit and producing only one-fourth of the industrial requirements, it is probable that the use of manzanita for pipe blocks will expand somewhat and will continue at least until normal Mediterranean trade is resumed. If trade practices return to the same basis as before the war, this new California industry will fade away in favor of the less costly brierwood. The possibility remains that the supplies of genuine brierwood will be diminished in the future to such an extent that the smoking-pipe industry will again turn to manzanita as a permanent resource. Furthermore, there are several possible developments in the trade which might tend to make manzanita an effective competitor of brierwood and thus stabilize the present industry.

The primary factor that would keep manzanita in the market is the reduction in production costs to bring the price of blocks more in line with that of the imported product. It is probable that some reduction in costs could be attained by further mechanization of burl extraction, increase in milling efficiency, and better organization between extraction and milling. Costs of pipe blocks could be reduced if markets for other manzanita products could be developed. Some burls of choice quality and large size might be more valuable for manufacture into novelties, turnery, small furniture, and even veneer for figured panels. These burls could be made to bear a proportionately greater share of the cost of extraction than pipe burls from the same area. The stems of manzanita plants are now wasted or, at best, used as firewood. These might well be made into rustic furniture and novelties. The use of stems or large pieces of burl depends upon the working out of seasoning methods that will bring the material to usable dryness without checking. The techniques of chemical seasoning recently developed at the Forest Products Laboratory, Madison, Wisconsin, should prove helpful in this regard. Means of utilizing the sawdust and trimmings that constitute 70 to 80 percent of pipe burls warrant research because of the irregular fiber structure, which is unique among commercial woods. Chemical investigations might disclose value in the soluble materials which are extracted from the blocks when they are boiled. Profitable utilization of any manzanita material which is not used for pipe blocks tends to spread the cost of production and lower the cost of the blocks.

The terms "brier" and "brierwood" have long been associated with good smoking quality in the minds of the pipe-smoking public. For this reason pipe manufacturers will probably encounter some sales resistance in the introduction of alternative pipe woods. The logical solution to this problem would seem to be a trade promotion campaign to extol the virtues of manzanita. If the smoking quality of the wood is, in fact, not inferior to "genuine brier," it is possible that the market could be led to demand "genuine manzanita" for smoking pipes. In this event, even though the cost per block were a few cents higher than imported wood after the war, the manzanita block industry could be at least partly sustained. A domestic source of pipe wood should be attractive to manufacturers, since they could more easily estimate future supplies and, to some extent, develop supplies to meet their demands.

Although there have been mentioned some possibilities that might result in a permanent manzanita-block industry, it would be unwise for any owner of land bearing merchantable burls to anticipate a certain sale, since the industry is thus far localized. It would be advisable, however, for owners of such land to use extra care to protect them from fire. Some landowners are now reaping the benefits of forest-fire protection, while others have found that fire damage has prevented the sale of many tons of burls.

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